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Benjamin K. SOVACOOL
Vermont Law School

Ann FLORINI
Singapore Management University, annflorini@smu.edu.sg

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Examining the Complications of Global Energy Governance

Benjamin K Sovacool and Ann Florini*

This article systematically examines fundamental obstacles to effective and efficient global energy governance. The first part of the article defines and conceptualises governance, global governance and global energy governance. It also explores the existing global energy governance architecture, depicting six types of global energy governor – intergovernmental organisations, summit processes, international non-governmental organisations, multilateral financial institutions, regional organisations that involve two or more countries as members and hybrid entities – and a sample of 42 such institutions and organisations currently operating around the world. The second part of the article corrects some emerging misconceptions about global energy governance: that effective forms of governance are likely to occur because they have net benefits; that Western forms of energy governance can be transplanted to the rest of the world; and that regional energy governance is in some ways preferable to global energy governance. The article concludes that more nuanced and careful assessment will be needed, and misconceptions abandoned, if we are truly to respond to the governance issues induced by deteriorating energy security and growing emissions of greenhouse gases.

In his famous book *Slaughterhouse-Five*, Kurt Vonnegut asks readers to imagine what the firebombing of Dresden, Germany, during the Second

* Benjamin K Sovacool, the corresponding author, is Visiting Associate Professor at Vermont Law School, where he directs the Energy Security and Justice Program at the Institute for Energy and the Environment. Ann Florini is Visiting Professor of Political Science at the School of Social Sciences at Singapore Management University. They can be contacted by email at, respectively, sovacool@vt.edu and annflorini@smu.edu.sg.

World War would have looked like in reverse.[1] American bombers, full of holes and wounded men, would have taken off backwards from airfields in England. German fighter planes would have sucked bullets and shells out of the aircraft over France. The bombers themselves would have opened their doors and 'exerted a miraculous magnetism' to shrink flames, restore buildings, and bring the dead back to life. What amazing machines, Vonnegut mused, the tools of war would be if they instead did the opposite.

The same could be said about the existing technologies that emit greenhouse gases into our atmosphere. What a wonderful sight it would be to witness factories, power plants, refineries and vehicle exhaust systems sucking emissions right out of the air. Engineers and scientists would be standing by to transform them into easily stored and transported tonnes of coal, cubic feet of natural gas and barrels of oil. Coal miners and petroleum geologists would rush to place the carbon-intensive fuels back deep into the earth where they would no longer harm our atmosphere. In essence, our technology would be geared towards doing exactly what nature has done over millions of years to keep our climate stable.

The above example dramatises the types of technological systems we would need to create a more sustainable energy future, but of course the problem is that they do not yet (and may never) exist. Although much of the current climate and energy debate still assumes that we can tinker our way out of the problem, we argue that policy-makers and individuals need to be thinking about how they can effectively govern our way out of it. Effective forms of energy governance – how the rules concerning energy production and use are set and enforced – are an essential part of the transition to low-carbon economies.[2]

This article systematically examines fundamental obstacles to effective and efficient global energy governance. The first part of the article defines and conceptualises governance, global governance and global energy governance. It also explores the existing global energy governance architecture, depicting six types of global energy governor and a sample of 42 such institutions and organisations currently operating around the world. The second part of the article corrects three emerging misconceptions about global energy governance:

- that effective forms of governance are likely to occur because they have net benefits;
- that Western forms of energy governance can be transplanted to the rest of the world; and
- that regional energy governance is preferable to global energy governance.

1 Kurt Vonnegut, *Slaughterhouse-Five, or the Children's Crusade; A Duty-Dance with Death* (Doubleday Press, 1966).

2 Ann Florini and Benjamin K Sovacool, 'Who Governs Energy? The Challenges Facing Global Energy Governance' (2009) 37(12) *Energy Policy* 5239–5248.

Global energy governance and governors

The term 'energy governance' has gained popularity in recent years, owing perhaps in part to the pressing nature of global energy problems as well as the promise that new actors such as corporations and members of civil society hold in addressing gaps between national energy policies and strategies. A cursory literature review undertaken in January 2010 on four academic databases – LexisNexis, ScienceDirect, JSTOR and ESBCO Host – revealed no fewer than 1,173 articles using the term 'energy governance' in their title or abstract in the past five years. But what does the phrase really mean?

It is best to begin with 'governance'. Table 1 suggests that governance in its most basic sense refers to the processes, systems and actors involved in addressing collective problems that individuals and markets cannot solve for themselves, as well as making and enforcing rules.[3] The classic provider of governance is government, which has systems to make rules and coercive power to back them up. But the private sector, civil society, financial institutions and a variety of other organisations can offer governance as well, such as the World Bank setting conditions on the loans that they give to developing countries or companies undertaking corporate social responsibility programmes. When applied to energy, such a definition implies that energy governance encompasses rule-making and enforcement that aims to overcome the collective action problems related to energy supply and use. It involves the *processes* of agenda-setting, negotiation, implementation, monitoring and enforcement of rules and agreements related to energy, as well as the *actors* connected to energy including governments, non-governmental organisations (NGOs), civil society groups, corporations, citizens, public–private partnerships (PPPs) and ordinary consumers. Each of these, like other forms of governance, can also differ by scale, from the individual or the household to the local, state or provincial level, or extending even further to the national and global level. Thus, global energy governance refers to the rules and actors related to energy that cross national borders.

3 Ann Florini, *The Coming Democracy: New Rules for Running a New World* (Brookings Institution, 2005).

Table 1: Conceptualising governance, global governance and global energy governance

Term	Definition
Governance	Any and all of the myriad ways in which groups of people attempt to solve collective action problems, deal with market failures and ensure the provision of public goods
Global governance	Efforts to deal with the wide range of border-crossing issues involving multiple states and other actors from multiple parts of the world
Global energy governance	Making and enforcing rules to avoid the collective action problems related to energy at a scale beyond the nation-state

Like the concept of global environmental governance,[4] the concept of global energy governance can be used to offer different types of insight for scholarly research on energy and climate. It can represent an analytical tool to make sense of current socio-political configurations and transformations in the energy sector, especially the shift from classic nation-centred governance structures to the more complicated, multilayered and non-hierarchical structures espoused by private actors. It can represent a critical concept that challenges the inadequacies of national approaches to addressing key energy problems, a sort of political programme to redirect problem-solving agendas. It can represent a broadening of responsibilities of existing governments as they expand into new areas or attempt to reclaim some of their former sovereignty on energy issues. And, global energy governance can describe the property of a system, something that can be measured and described, its causes and effects evaluated.

A key component of global energy governance, naturally, is the actors that play roles in agenda-setting and rule-making – the governors. Six types of global energy governor appear most prominent today. The first is intergovernmental organisations (IGOs), created and funded by national governments, which have secretariats that answer to some governing body, such as the International Energy Agency. The second is summit processes that offer a sort of 'halfway house' between formal IGOs and the normal practices of diplomacy between national governments; these typically have no charter, fixed membership or secretariat, but offer a flexible way to address pressing multilateral problems. The third is international non-governmental organisations (INGOs), not confined to any particular country or summit process, which usually have boards and receive funding from both the public and the private sector. The fourth is multilateral financial institutions (MFIs), predominantly the development banks, which

4 Frank Biermann and Philipp Pattberg, 'Global Environmental Governance: Taking Stock, Moving Forward' (2008) 33 *Annual Review of Environment and Natural Resources* 277–294.

provide economic and technical assistance to national governments and offer loans for energy projects. The fifth is regional organisations that involve two or more countries as members that attempt to tackle energy issues in a particular segment of the world. The sixth is hybrid entities including everything from transnational networks of advocacy to quasi-regulatory private bodies, global policy networks and PPPs that may weave some of the previous five types of governor together and may also include private sector entities. Note that we have excluded transnational corporations as global governors unless they form partnerships or networks with other actors. Even though they have long been key players in the oil and gas sectors and liberalised electricity markets, along with national and state ministries and government regulators, their influence is often indirect and global governance concerns are secondary to profits and national policy.

To provide a rough map of the global energy governance architecture, Table 2 depicts no less than 50 global energy governors at work in early 2012. Table 2 includes 12 IGOs, two summit processes, three INGOs dedicated exclusively to energy, six MFIs, seven regional organisations and 20 hybrids. The list is not meant to be exhaustive, only indicative of many of the major actors currently involved in the global energy governance scene.

Table 2: Fifty global energy governors[5]

Institution	Acronym	Form of global governance	Date of creation	Central location	Primary function	Description
United Nations System	UN	IGO	1945 for core UN. Specialised agencies created in various years	New York, US; Vienna, Austria; Geneva, Switzerland	Building international peace and security as well as promoting social progress, better living standards and human rights	Both core UN bodies (United Nations Environment Programme, United Nations Development Programme) and loosely affiliated specialised agencies (Food and Agricultural Organization; International Atomic Energy Agency) work on various energy issues. The newly formed umbrella UN Energy is intended to coordinate their efforts

5 Sources: Achim Steiner, Thomas Wälde, Adrian Bradbrook and Frederik Schutyser, 'International Institutional Arrangements in Support of Renewable Energy' in Dirk Abmann, Ulrich Laumanns and Dieter Uh (eds), *Renewable Energy: A Global Review of Technologies, Policies, and Markets* (London: Earthscan, 2006), 152–165; John Kessels, Stefan Bakker and Bas Wetzelaer, *Energy Security and the Role of Coal* (IEA Clean Coal Centre CCC/131, 2008); Andreas Goldthau and Jan Martin Witte, 'Back to the Future or Forward to the Past? Strengthening Markets and Rules for Effective Global Energy Governance' (2009) 85(2) *International Affairs* 373–390; Florini, note 3 above; various institutional websites.

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Global Environment Facility	GEF	IGO	1991	Washington DC, US	As the world's largest public environment fund, GEF sponsors environmental projects, through grants to developing countries, for biodiversity, climate change, international waters, deforestation, and biodiversity loss. GEF was made independent of the World Bank in 1994	GEF is the entrusted financier for projects for the United Nations Framework Convention on Climate Change as well as several other international conventions relating to energy. It has so far allocated almost US$9bn in funds including US$40m as part of a Least Developed Countries Fund for Climate Change and the Special Climate Change Fund
International Energy Agency	IEA	IGO	1974	Paris, France	To establish a reporting system on oil prices and create an emergency oil-sharing system, and to serve as a key information source on energy	IEA has been relatively successful at coordinating national action among oil-consuming countries, although membership excludes such key oil consumers as China and India. It is the primary producer of global energy statistics and is moving to address broader energy and climate topics
Organización Latinoamericana de Energía	OLADE	IGO	1973	Quito, Ecuador	Developing energy security and sustainable development for South America, Central America and the Caribbean	Initially conceived as a platform for encouraging energy integration and created by the Lima Agreement, OLADE now manages a number of projects related to renewable energy and energy efficiency planning, capacity-building and training, information systems and electricity development
Energy Charter Conference Treaty	ECT	IGO	1991	Brussels, Belgium	Places an obligation on its 51 current members to facilitate safe transit of energy fuels across territories, with the aim of creating a transparent and efficient energy market	Offers dispute settlement over energy transit related issues, seeks to protect European foreign investments in energy and promotes free-flowing trade of energy commodities. ECT was intended to set clear rules governing cross-border transit of oil and gas via pipelines, but Russia, a key player, has announced it will not join

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Organisation for Economic Co-operation and Development	OECD	IGO	1961	Paris, France	Strives to promote democracy and economic growth through employment, raised living standards, financial stability and trade among its 30 country members	OECD manages the Nuclear Energy Agency, which explores the peaceful use of nuclear energy through international cooperation to develop the scientific, legal and technological basis for nuclear fission
International Renewable Energy Agency	IRENA	IGO	2009	Abu Dhabi, United Arab Emirates	Charged with promoting renewable energy among its 142 member countries	Although only about one year old, IRENA has already begun developing a knowledge base of best practices for renewable energy promotion, providing policy advice, facilitating technology transfer and financing and stimulating research on all aspects of renewable energy
Generation IV International Forum	GIF	IGO	2001	Paris, France	To establish the feasibility and performance capabilities of the next generation of nuclear energy systems	Comprising Argentina, Brazil, Canada, France, Japan, the Republic of Korea, the Republic of South Africa, the United Kingdom and the United States, GIF is committed to promoting the global development and use of advanced nuclear power technologies including thermal and fast neutron spectra reactors, closed and open fuel cycles and a wide range of reactor sizes from very small to very large. GIF aims to commercialise these systems by 2015 to 2030
Organization of the Petroleum Exporting Countries	OPEC	IGO	1960	Vienna, Austria	Initially created at the Baghdad Conference in 1960 by Iran, Iraq, Kuwait, Saudi Arabia and Venezuela, OPEC has since grown to 12 major oil-exporting countries that vow to 'stabilise oil prices' by matching expected demand to oil production	OPEC member countries coordinate their production and refining of oil to ensure the best return on their investments, with ministers meeting twice a year to review production quotas, reserve to production ratios and market trends for petroleum

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Gas Exporting Countries Forum	GECF	IGO	2001	Doha, Qatar	Founded by some of the leading natural gas producers to represent and support their mutual interests	Members control 73 per cent of gas reserves and 41 per cent of current production, and membership consists of Algeria, Bolivia, Brunei, Egypt, Indonesia, Iran, Libya, Malaysia, Nigeria, Oman, Qatar, Russia, Trinidad and Tobago, United Arab Emirates and Venezuela, with Norway participating as an observer
International Energy Forum	IEF	IGO	1991/2002	Riyadh, Saudi Arabia	Although its first summit was held in 1991 hosted by France and Venezuela, its formal secretariat was established following the Osaka Announcement in 2002. IEF is the world's largest recurring gathering of energy ministers	Holds forums designed to focus attention on key global energy issues and also coordinates the Joint Oil Data Initiative along with efforts from other organisations such as APEC, IEA, OLADE and OPEC
International Partnership for the Hydrogen Economy	IPHE	IGO	2003	Berlin, Germany	To foster international cooperation in hydrogen and fuel cells and seek to organise demonstration and commercialisation of hydrogen technologies	Establishes common codes and standards conducive to the global adoption of hydrogen systems through its 17 member countries
Group of Eight	G8	Summit Process	1975/1997	Rotating meetings hosted in turn by member states	To provide an informal and small forum for government leaders to discuss policy coordination	Emerged in the mid-1970s in response to dislocations from oil price shocks. Until recently its attention to energy waxed and waned with the price of oil. Beginning with its 2005 summit, much attention is now given to climate change

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Summit of the Americas	—	Summit Process	1994	Washington DC, US	Organisation of North, South and Central America countries that discusses a wide range of issues of common regional interest including illegal narcotics, security, immigration, trade and energy	The second summit held in Santiago, Chile in 1998 called for energy integration and sustainable development in the region through harmonisation of fiscal and legal policies and processes
World Energy Council	WEC	INGO	1923	London, UK	Charged with promoting sustainable energy, through research and analysis, energy projections, and recommendations in 93 countries	Produces publications, hosts conferences and arranges meetings covering all major energy sources as well as a World Energy Conference once every three years
World Council for Renewable Energies	WCRE	INGO	2001	Bonn, Germany	Promotes renewable energy through information, agenda-setting and networking	A precursor to IRENA, WCRE still plays a role providing analysis on the international barriers to renewable energy, providing advice on renewable energy targets, evaluating the performance of commercially available technologies and identifying best practices in renewable energy promotion
Global Energy Network Institute	GENI	INGO	1991	San Diego, California, US	Dedicated to promoting the interconnection of national electric power networks so that renewable energy resources can be integrated on a regional and global scale	Focuses on raising awareness about the benefits of high-voltage, interconnected electricity transmission networks through research, including electric power maps, simulations and visualisations developed in partnership with the World Resources Simulation Center
Asian Development Bank	ADB	MFI	1966	Manila, Philippines	To facilitate economic development and reduce poverty among its member countries	ADB has provided billions of dollars of energy infrastructure lending and restructured energy and electricity markets. Historically, ADB has invested in capital-intensive technologies and fossil fuels, but there is some evidence of a shift now in priorities to renewable energy and energy efficiency

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World Bank Group	WBG	MFI	1944	Washington DC, US	Umbrella organisation, consisting of the International Bank for Reconstruction and Development, the International Development Association, the International Finance Corporation, the Multilateral Investment Guarantee Agency and the International Centre for Settlement of Investment Disputes, which funds and provides technical expertise to development projects (wide-ranging) in developing countries aimed at fighting poverty and promoting foreign direct investment	Much larger than the other multilateral developments, WBG offers billions of dollars of loans each year for energy development, mostly in conventional (and fossil-fuelled) infrastructure. The World Bank is looking into how to improve access for developing countries, in a sustainable way
European Bank for Reconstruction and Development	EBRD	MFI	1991	London, UK	Supports projects in Eastern Europe and Central Asia by investing in private sector clients and encouraging free market mechanisms	Provides loans for conventional infrastructure and electricity networks and also launched the Sustainable Energy Initiative in 2006, with a key focus on investing about €6bn in energy efficiency and cleaner forms of energy supply
African Development Bank	AfDB	MFI	1964	Abidjan, Côte d'Ivoire	Invests in poverty reduction and sustainable development projects in its regional member countries	Focused mostly on energy development and power sector reform, enhancing export opportunities for its members and increasing equitable access to energy services
Inter-American Development Bank	IDB	MFI	1959	Washington DC, US	The multilateral development bank for Latin America and the Caribbean	Aims to promote regional energy integration and investments in energy infrastructure, also launched a Sustainable Energy and Climate Change Initiative in 2008 to offer US$1bn in loans for energy efficiency, renewable electricity and biofuels

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International Fund for Agricultural Development	IFAD	MFI	1977	Rome, Italy	Combats rural hunger and poverty in developing countries through low-interest loans and direct assistance	Works with the rural poor, governments, donors and NGOs to improve rural access to biogas and solar home system units, and to reduce drudgery and 'lighten the load' for rural women
Association of Southeast Asian Nations	ASEAN	Regional Organisation	1967	Jakarta, Indonesia	Aims to unify the geopolitical region of South-East Asia and encourage economic growth, social progress, political stability and peace	Manages several energy centres and ministerial meetings including a Council on Petroleum and an Energy Research Centre and often brokers bilateral and multilateral agreements between its members and also between Southeast Asia and major energy exporters and importers
European Union	EU	Regional Organisation	1993	Brussels, Belgium	Responsible for promoting European economic and political integration and establishing a common market for trade and exchange	Promotes interconnected markets for energy among its members and abroad, strategic energy stockpiling and robust emissions reduction targets and national targets for renewable energy
Organization of the Black Sea Economic Cooperation	BSEC	Regional Organisation	1992	Istanbul, Turkey	Encourages economic and political interaction and harmony between its 11 member states around the Black Sea, with observer status given to several other countries including the United States	Their plan of action on energy consists in ensuring energy security for each other, integration of an energy market through harmonising legislation, adopting best practices in environmental standards, research, demonstration and investment in energy efficiency, developing renewable energy and micro-generation, and promoting regional energy exports globally

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Shanghai Cooperation Organization	SCO	Regional Organisation	2001	Beijing, China	Formerly the Shanghai Five (China, Kazakhstan, Kyrgyzstan, Russia and Tajikistan), SCO was created after Uzbekistan was added and India, Iran, Mongolia and Pakistan were offered observer status. Its primary function is to address security-related concerns, including terrorism	Member states have agreed on an 'energy action plan' to unlock the hydrocarbon resources of the Caspian Sea, establish a unified market for oil and gas exports and promote preferential bilateral production-sharing agreements
Southern African Development Community	SADC	Regional Organisation	1992	Gaborone, Botswana	Its 14 member states aim to develop regional economies, reduce poverty and harmonise economy and trade policies, and have reduced internal trade barriers and are working towards a single currency	The organisation actively promotes large-scale electricity and transmission projects such as the Southern African Power Plant Western Corridor Transmission Project and other regional electricity interconnections as well as a regional petroleum and gas association between Angola, Botswana and the Democratic Republic of Congo and coordinated rural energy planning
Asia-Pacific Economic Cooperation	APEC	Regional Organisation	1989	Singapore	A non-binding intergovernmental group of 21 economies, including all Asian majors, whose primary focus is to reduce trade barriers and improve investments and exports among members	The organisation set up the energy security initiative in 2000, which includes data-sharing and the Joint Oil Data Initiative to counter supply disruptions. Its Sydney Declaration in 2007 focused on climate change and energy security. Its action agenda includes several goals such as improving energy efficiency, increasing forest cover and strengthening low-carbon energy technology
South Asian Association for Regional Cooperation	SAARC	Regional Organisation	1985	Kathmandu, Nepal	To facilitate trade and regional cooperation between Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka.	Committed to a number of energy-related goals, including strengthening South Asia's capacity to address energy problems, enhancing energy trade, establishing regional electricity grids and natural gas pipelines, and encouraging investments in renewable energy and energy efficiency

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Central Asia Regional Economic Cooperation	CAREC	PPP/Hybrid	1997	Manila, Philippines	A unique consortium funded by eight national governments and six multilateral organisations (including ADB and WBG) dedicated to reducing poverty and improving infrastructure development	Mobilises about US$2.4bn in capital each year to be invested in roads, transport, water and electricity
Renewable Energy and Energy Efficiency Partnership	REEEP	PPP/Hybrid	2002	Vienna, Austria	To reduce greenhouse gas emissions, improve access to reliable and clean forms of energy in developing countries and promote energy efficiency	Has formed partnerships with more than 120 governments, banks, businesses, NGOs and IGOs and invested €16.4m in more than 145 projects. However, REEEP implements only small-scale projects and lack of permanent funding forces the agency to focus on the short term
Global Network on Energy for Sustainable Development	GNESD	PPP/Hybrid	2002	Roskilde, Denmark	To serve as a knowledge network of developing world centres of excellence and network partners whose main objective is to reach the UN's Millennium Development Goals	Oriented to address energy access issues and promote renewable energy technologies that reduce poverty. Mainly conducts workshops and publishes reports on energy and poverty in Asia, Africa and Latin America
International Network on Gender and Sustainable Energy	ENERGIA	PPP/Hybrid	1996	Leusden, the Netherlands	Informal international network working on gender and sustainability issues. Modus operandi is regionalisation of activities through networks	Focused entirely on empowering rural and urban women through the use of energy. ENERGIA offers three types of primary assistance around the world: placing gender and energy issues on the international agenda for countries and development institutions (including national gender audits), building capacity on gender integration and energy through training materials and workshops and conducting research and analysis on case studies and the gendered impacts of energy production and use

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Appropriate Infrastructure Development Group	AIDG	PPP/Hybrid	2005	Boston, US	To improve access to electricity, sanitation and drinking water	Provides business incubation loans between US$10,000 and US$100,000 aimed at procuring energy equipment and technology, providing education and training on energy use, and serving as seed money for energy start-up companies
International Network for Sustainable Energy	INFORSE	PPP/Hybrid	1992	Hjortshøj, Denmark	Established as part of the Rio Convention, INFORSE represents a network of 140 NGOs operating in 60 countries and is funded by a mix of national governments, multilateral institutions and civil society organisations. The organisation is dedicated to promoting sustainable energy and social development	Focuses on four areas: raising awareness about sustainable energy use; promoting institutional reform among national governments; building local and national capacity on energy related issues; and supporting research and development
World Business Council on Sustainable Development	WBCSD	PPP/Hybrid	1995	Geneva, Switzerland	Also founded at the 1992 Rio Earth Summit, WBCSD is a global association of some 200 companies and 55 partner and regional organisations dealing with business and sustainable development that sees its primary function as advocating for businesses and influencing policy	Aims to create a platform for companies to explore sustainable development best practices, share knowledge, and advocate business positions. Also manages a variety of business-sponsored projects including energy efficiency in buildings, water, cement, electricity supply, forest products, mining and minerals and tyres
Collaborative Labeling and Appliance Standards Program	CLASP	PPP/Hybrid	1999	Washington DC, US	To foster economic development, stimulate global trade and alleviate poverty through the use of standards and labels	Funded by a variety of organisations including the US Government, WBG and UN, CLASP assists with the implementation of various standards and labels relating to energy and energy efficiency technologies and services

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Efficient Energy for Sustainable Development Partnership	EESD	PPP/Hybrid	2002	Washington DC, US	Launched as part of the World Summit on Sustainable Development by the US Department of Energy, EESD intends to improve the productivity and efficiency of energy systems. Its partners include businesses, NGOs, academia and financial institutions	Focused on increasing overall energy efficiency by ten per cent or more in 20 countries by 2012
Global Village Energy Partnership	GVEP	PPP/Hybrid	2005	London, UK	Seeks to reduce poverty through accelerated access to modern energy services through its 2,000-plus members, which include a mix of private companies, national governments, development agencies, MFIs and universities	Committed to forming partnerships from the bottom up at the community and municipal levels to increase energy access and also build capacity to adapt to climate change
International Institute for Energy Conservation	IIEC	PPP/Hybrid	1984	Vienna, Virginia, US	To assist both the public and private sectors in implementing energy efficiency, transport and environmental policies. Funded by community groups, national governments and members of civil society	Conducts work on standards and labels, demand-side management, climate change mitigation and adaptation, transport planning, energy efficiency and pollution prevention, renewable energy and water
Partnership for Clean Fuels and Vehicles	PCFV	PPP/Hybrid	2002	Nairobi, Kenya	To reduce vehicular air pollution in developing countries	Has 90 partners including governments, industry members and universities, and primarily promotes lead-free, low-sulphur fuels and cleaner vehicle standards and technologies, including cleaner diesel in Pakistan and 'eco driving' courses in Latin America

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Clinton Climate Initiative	CCI	PPP/Hybrid	2006	New York, NY, US	Part of the William J Clinton Foundation, CCI manages an extensive programme to undertake building retrofits, improve outdoor lighting, reduce waste, measure greenhouse gas emissions, encourage non-motorised transport and promote 'climate positive' communities in major cities, conducts research on carbon capture and storage and concentrating solar power and works with Cambodia, Guyana, Indonesia, Kenya and Tanzania to prevent deforestation	Brings stakeholders from industry (such as energy service contractors and the manufacturers of energy-efficient equipment), the public sector (municipal and city governments) and finance (banks and lending agencies) to conduct climate-related projects in 40 metropolitan areas; the forestry project has also teamed up with university research institutes and government agencies
Energy Through Enterprise	E+Co	PPP/Hybrid	1997	Bloomfield, NJ, US	Focuses on clean energy innovation by partnering MFIs with NGOs and the private sector through eight international offices to implement projects in 20 developing countries	Provides debt and equity to support the expansion of energy services to rural populations around the world through the use of entrepreneurs
Global Energy Efficiency and Renewable Energy Fund	GEEREF	PPP/Hybrid	2004	European Investment Bank, Luxembourg	Created by the European Commission to promote PPPs in clean energy through private equity funds to small and medium-sized enterprises in emerging economies	Has so far leveraged or disbursed about US$200m in more than 20 projects in the developing world

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Small-Scale Sustainable Infrastructure Development Fund	S3IDF	PPP/Hybrid	2002	Cambridge, MA, US	Promotes a Social Merchant Bank approach to help local entrepreneurs create micro-enterprises that provide infrastructure services to the poor	Has so far built a portfolio of almost 200 small investments and associated enterprises in India with an additional 100 projects in the pipeline
Solar Electric Light Fund	SELF	PPP/Hybrid	1990	Washington, DC, US	Created to empower people in developing countries to escape poverty, harnessing energy from the sun	Has established more than a dozen self-sustaining solar energy projects in 11 countries spread across Africa, Asia and South America
Acumen Fund	AF	PPP/Hybrid	2001	New York, NY, US	Formed to reduce poverty by investing in social enterprises and 'breakthrough' ideas in the health, water, housing, energy and agriculture sectors	Approves about US$6m per year in social enterprise funds for microhydro, solar, biogas, biomass and lighting projects in India, Pakistan and East Africa
Global Alliance for Clean Cookstoves	GACC	PPP/Hybrid	2010	Washington, DC, US	Committed to saving lives, improving livelihoods and addressing climate change by creating a thriving global market for fuel-efficient cookstoves	Backed by the US Department of State, the United Nations Foundation, and more than 200 other partners from the public, private and non-profit sectors, the Alliance has set the goal of distributing 100 million cleaner cookstoves by the year 2020
Green Climate Fund	GCF	PPP/Hybrid	2010/2011		A fund emerging from the Conference of Parties (COP) climate change discussions at Copenhagen, Denmark and Durban, South Africa to coordinate and consolidate funding on climate change mitigation and adaptation	Attempts to harmonise ongoing global financing efforts related to energy and transport infrastructure (among others) from the World Bank, the Global Environment Facility, the Adaptation Fund, the Clean Development Mechanism of the Kyoto Protocol and the G8

As the table makes clear, global energy governors represent a hodgepodge of multiple actors addressing various governance issues related to energy. These issues include such disparate topics as:

- the need for agreed rules to govern cross-border energy investments (eg ECT);
- coordination among oil-importing countries to ameliorate the impact of supply shocks (eg IEA);
- addressing inequities that leave billions of people unable to access energy services (multiple organisations of all types, notably the MFIs and many of the recently created hybrids);
- the need to deal with the environmental externalities resulting from fossil fuel-based energy systems (GEF, IEA, ADB and many others); and
- building adaptive capacity and resilience to social and environmental vulnerabilities induced by climate change in least developed and middle-income countries (GEF, WB, GCF and many others).

There is very little coordination between most of these governors. It would seem logical for national governments to have, at a minimum, a coherent strategy for dealing with the various organisations of which they are members, yet by and large they lack anything approaching a coherent, long-term perspective for addressing the full range of energy governance issues.

This incoherence is reflected and amplified at the international level, where authority is fragmented and often altogether lacking. The sheer number of actors creates a global energy governance scene that appears frenetically busy – simply attending just the climate change meetings sponsored by all the relevant governors would constitute several full-time jobs. Or, as one study recently concluded, the global energy system 'barely has clearly defined processes, rules for regulation, and interference'.[6] With energy prices remaining volatile and the world making little progress to ameliorate climate change, energy poverty and insecurity, it is clear that the current global energy governance model is full of sound and fury, yet signifies far too little substance.

Three emerging misconceptions

Understanding the inadequacies of current global energy governance requires clearing up some misconceptions that are beginning to appear in the literature.

The first is that effective global energy governance is likely to occur (or is already occurring) because it has advantages. Governance scholar Kirton tells us

6 A Goldthau and BK Sovacool, 'The Uniqueness of the Energy Security, Justice, and Governance Problem' (2012) 41 *Energy Policy* 232–240.

that the major economies of the world, through the Group of Eight, have 'dealt with global energy governance in a major and very successful way'.[7] Kohl writes that institutions such as the IEA have 'demonstrated that they are adapting to the new challenges of a globalized energy work and are cooperating with the new consumers on energy security and responses to climate change'.[8] Benner and his colleagues suggest that 'over the past 15 years the good and the bad have been established as normative terms (along with transparency) in progress toward better resource governance' and 'the powerful can no longer claim to not know the tragic outcomes of bad resource governance'.[9] Patt argues that shifts to supranational forms of energy governance are 'very likely' to occur eventually because they offer 'positive net benefits'.[10] He also suggests that investments in cleaner forms of energy supply, such as wind and solar, will occur because they bring environmental, social and economic benefits. The logic in Patt's argument seems intuitive: if making collective rules on energy is so important, and investing in cleaner forms of energy supply pays dividends, why would not actors rush to set common frameworks and agreements? And if renewable energy systems have so many advantages, why wouldn't governments and consumers naturally embrace them?

However, an enormous social science literature has demonstrated conclusively that forms of governance do not necessarily emerge in response to all collective action problems whose solutions depend on effective governance – starting with Mancur Olson[11] and Garrett Hardin[12] and skilfully summarised by Russell Hardin,[13] Elinor Ostrom[14] and Thomas Dietz et al.[15] The existence of positive net benefits is a good starting point for a negotiation, but only that.

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7 John Kirton, 'The G8 and Global Energy Governance: Past Performance, St Petersburg Opportunities', paper presented at a conference on 'The World Dimension of Russia's Energy Security', sponsored by the Moscow State Institute of International Relations (MGIMO), Moscow, 21 April 2006, 1.

8 Wilfrid Kohl, 'Consumer Country Energy Cooperation: The International Energy Agency and the Global Energy Order' in Andreas Goldthau and Jan Martin Witte (eds), *Global Energy Governance: The New Rules of the Game* (Brookings Institution, 2010), 219.

9 Thorsten Benner, Ricardo Soares de Oliveria and Frederic Kalinke, 'The Good/Bad Nexus in Global Energy Governance' in Andreas Goldthau and Jan Martin Witte (eds), *Global Energy Governance: The New Rules of the Game* (Brookings Institution, 2010), 287–314.

10 Anthony Patt, 'Effective Regional Energy Governance – Not Global Environmental Governance – is What We Need Right Now for Climate Change', (2010) 20 *Global Environmental Change* 33–35.

11 Mancur Olson, *The Logic of Collective Action: Public Goods and the Theory of Groups* (Cambridge, MA: Harvard University Press, 1965).

12 Garrett Hardin, 'The Tragedy of the Commons' (1968) 162 *Science* 1243–1248.

13 Russell Hardin, *Collective Action* (Washington, DC: Resources for the Future, 1982).

14 Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (Cambridge: Cambridge University Press, 1990).

15 Thomas Dietz, Elinor Ostrom and Paul Stern, 'The Struggle to Govern the Commons' (2003) 302(5652) *Science* 1907–1912.

It also matters who would enjoy those positive benefits, who would have to pay the costs of providing the governance, whether institutions exist that can channel action and whether policy-makers are aware of the potential win-win scenarios. If the simple existence of positive net benefits were sufficient, the Doha round of trade negotiations would not be mired down, biodiversity losses would not be accelerating around the planet and rich countries would be pouring serious resources into the establishment of effective health systems in their poorer neighbours. Sadly, many supranational problems just do not get solved, despite the efforts of a large class of individuals pointing out the wide range of positive net benefits that would result. An extensive literature examining energy roles at various levels provides strong grounds for believing that it is difficult to achieve effective energy governance at any level, national or global.[16]

Consider the example of the G8, which in theory seems ideally suited to overcoming collective action problems given its small size, the political power of its members and the relatively low costs of negotiation between parties, but in practice struggles to govern energy effectively. Lesage and colleagues looked at a broader range of energy issues, including those posed by climate change, and assessed the performance of the G8 over the past few years.[17] They concluded that it has 'failed to exert global political leadership' where most needed. Although the G8 has contributed to expanding the scope of the IEA and establishing a global organisation to promote energy efficiency, overall, the authors emphasised, the G8 has proven incapable of producing effective global energy governance because of competing interests within the organisation, a dearth of effective monitoring and mechanisms to ensure compliance, and its inability to accommodate non-member countries. The G8 has also been unable to overcome internal divergence on reduction targets for greenhouse gases, energy efficiency promotion efforts or a unified stance on how to handle Russia. Posing somewhat of a paradox, Van de Graaf and Lesage have found that the G8 has been most effective at influencing the energy decisions of parties *external* to the group, such as China, India, Mexico, Russia and South Africa, rather than its own members.[18] These failures, given the absence of alternative overarching global energy governors, leave a void that is not easily filled. Or, as Lesage et al put it, 'although the G8 seem to have taken seat in the previously empty cockpit of global energy governance,

16 Goldthau and Witte (2009) note 5 above; see also AE Florini and BK Sovacool, 'Bridging the Gaps in Global Energy Governance' (2011) 17(1) *Global Governance* 57–74.

17 Dries Lesage, Thijs Van de Graaf and Kirsten Westphal, 'The G8's Role in Global Energy Governance Since the 2005 Gleneagles Summit' (2009) 15 *Global Governance* 259–277.

18 Thijs Van de Graaf and Dries Lesage, 'The International Energy Agency After 35 Years: Reform Needs and Institutional Adaptability' (2009) 4(3) *Review of International Organizations* 293–317.

the overall results are somewhat disappointing, due to the lack of concrete targets, the limited attention for demand control and energy saving, the non-binding nature of commitments, the ensuring problems with compliance, and the fact that… little money has been pledged'.[19]

The belief that investments in cleaner energy systems will occur merely because they would be beneficial, also part of Patt's argument, contradicts scores of studies examining the barriers to innovation and investment at every stage of the commercialisation and deployment process. The Interlaboratory Working Group documented dozens of barriers to cleaner energy technologies including misplaced incentives, inconsistent regulations and information and market failures.[20] Painuly surveyed a host of barriers and failures to global renewable energy penetration, highlighting in particular the problem of missing market infrastructure and lack of knowledge.[21] Beck and Martinot have noted that subsidies for conventional forms of energy, high initial capital costs, imperfect capital markets, lack of skills or information, poor market acceptance, technology prejudice, financing risks and uncertainties, high transaction costs and a variety of regulatory and institutional factors prevent optimal levels of renewable energy investment from occurring.[22] We interviewed more than 180 experts working for utilities, in government agencies, and the national laboratories and identified 38 non-technical barriers to the deployment of distributed generation, renewable energy and energy efficiency technologies.[23] Brown et al examined a selection of persistent financial, market, information and intellectual property barriers.[24]

Indeed, there has never been a systematic approach to developing global energy governance. Instead, rules and institutions emerge ad hoc, driven

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19 Lesage, Van de Graaf and Westphal, note 17 above and 'G8 + 5 Collaboration on Energy Efficiency and IPEEC: Shortcut to a Sustainable Future?' (2010) 38(11) *Energy Policy* 6419–6427.

20 Interlaboratory Working Group, 'Scenarios for a Clean Energy Future' (Oak Ridge, TN; Oak Ridge National Laboratory and Berkeley, CA; Lawrence Berkeley National Laboratory, 2000), ORNL/CON-476 and LBNL-44029.

21 JP Painuly, 'Barriers to Renewable Energy Penetration, a Framework for Analysis' (2001) 24 *Renewable Energy* 73–89.

22 F Beck and E Martinot, 'Renewable Energy Policies and Barriers' in Cutler Cleveland (ed), *Encyclopedia of Energy* (Academic Press/Elsevier Science, 2004).

23 See BK Sovacool, *The Dirty Energy Dilemma: What's Blocking Clean Power in the United States* (Westport: Praegar, 2008); BK Sovacool, 'The Cultural Barriers to Renewable Energy in the United States' (2009) 31(4) *Technology in Society* 365–373; and BK Sovacool, 'Rejecting Renewables: The Socio-technical Impediments to Renewable Electricity in the United States' (2009) 37(11) *Energy Policy* 4500–4513.

24 Marilyn A Brown, Sharon (Jess) Chandler, Melissa V Lapsa and Benjamin K Sovacool, *Carbon Lock-In: Barriers to the Deployment of Climate Change Mitigation Technologies* (Oak Ridge, TN: Oak Ridge National Laboratory, ORNL/TM-2007/124, November 2008).

by crises rather than by coherent strategies seeking broad benefits. The IEA was created only after the oil shocks of the early 1970s.[25] The European Commission formed a panel looking at energy security only after disputes between Belarus, Germany and Ukraine and Russia over natural gas created fuel shortages and higher prices.[26] The United States placed energy security issues at the forefront of its foreign policy only after Hurricane Katrina disrupted oil and gas imports and refineries.[27]

One final reason that effective global energy governance often does not occur is because it is a source of conflict, not cooperation, meaning actors often get stuck in the agenda and negotiation stages, and never reach implementation. Westphal has noted that energy governance represents a contested domain between power-based geopolitical concerns and multilateral and cooperative governance.[28] She argues that the history of energy production is a narrative of 'permanent conflict' and tensions between consumers and producers. Consumers of energy want competition among producers to lower prices, producers want consumers to be diffuse so they lack the collective bargaining power to challenge control over production. Other conflicts over energy governance can occur because of resource scarcity, geopolitical power moves and the diverging influence of consumer countries. Strong calls for large national energy champions, big enough to compete in the global marketplaces, are often at odds with a desire to enhance international market competition based on agreed rules. As she concludes: 'What has become apparent (again) over recent years is the fact that energy governance takes place in a field of tension between governance based on market and institutions (and the rule of law) on the one hand, and state-centered, power-based geopolitics on the other.'[29]

A second misconception is that various regional or multilateral successes in governance necessarily may provide models that can be exported to other regions or topics. Patt, for example, extrapolates from European experience to imply that it may offer a model for energy governance around the world. Patt says: 'nation states have agreed to be bound by the decisions of a supranational organization, because they see that it is to their benefit – or the benefit of their citizens – to do so.' [30] Kohl states that European Union (EU) countries 'have done well at integrating energy and climate goals in its

25 Florini, note 3 above.

26 Lesage, Van de Graaf and Westphal, note 19 above.

27 Karoly Nagy, 'The Additional Benefits of Setting Up and Energy Security Centre' (2009) 34 *Energy* 1715–1720.

28 Kirsten Westphal, 'Energy Policy Between Multilateral Governance and Geopolitics: Whither Europe?' [2006] *Internationale Politik und Gesellschaft* 44–63.

29 *Ibid* 58.

30 Patt, note 10 above.

program' and 'set a bold example for the world', again implying that their methods of cooperation should be replicated.[31]

Yet, as Gruber has shown, less powerful governments frequently sign up to such organisations or agreements not because they wish to be bound, but because they can't afford the costs of remaining outside the only club around (costs that may include the withholding of aid flows if they refuse to join).[32] The rules that are made by and for the powerful may work over the short term, but they do not form a solid basis for long-term systems of international cooperation. The lack of progress in recent years in international cooperation on everything from trade to climate to nuclear non-proliferation reflects a fundamental weakness in the existing institutions – their legitimacy is questioned by rising powers that increasingly insist on having a meaningful say. Far from seeing a meaningful shift from national sovereignty to supranational decision-making, we are seeing an increasing insistence on sovereign prerogatives by countries, such as China, India and Brazil, that can no longer be ignored. As Victor and Yueh conclude, 'although energy commodities and technologies are traded globally, the system for governing the markets for these important goods is fragmented and increasingly impotent'.[33]

Some, like Patt, contend that the 'blossoming of multilateral environmental agreements' could in time alleviate many pressing energy and climate problems, and he points to the Montreal Protocol as the 'most successful' of these. He also states that 'global environmental governance is here, and growing stronger'.[34] We agree that the Montreal Protocol is an exemplar among global environmental statutes, but it is about the *only* truly successful example. Further, we also question the efficacy of global environmental governance. Instances of failures are far more commonplace, and well-known cases include the 1992 Convention of Biological Diversity, which has not slowed rates of biodiversity loss, species extinction and habitat destruction;[35] the 1995 United Nations Fish Stocks Agreement, which has not halted the collapse of global fisheries;[36] and the 1997 Kyoto Protocol, which, as even Patt noted, has not slowed emissions of global greenhouse gases.[37]

31 Kohl, note 8 above, 200.

32 Lloyd Gruber, *Ruling the World: Power Politics and the Rise of Supranational Institutions* (Princeton University Press, 2000).

33 David G Victor and Linda Yueh, 'The New Energy Order' (2010) 89(1) *Foreign Affairs* 74.

34 Patt, note 10 above.

35 Carl Folke, CS Holling and Charles Perrings, 'Biological Diversity, Ecosystems, and the Human Scale' (1996) 6(4) *Ecological Applications* 1018–1024.

36 Ransom Myers and Boris Worm, 'Rapid Worldwide Depletion of Predatory Fish Communities' (2003) 423 *Nature* 280–283.

37 See J Reilly, R Prinn, J Harnisch et al, 'Multi-Gas Assessment of the Kyoto Protocol' (1999) 401 *Nature* 549–555; David G Victor, *The Collapse of the Kyoto Protocol and the Struggle to Slow Global Warming* (Princeton University Press, 2001); David G Victor, 'Toward Effective International Cooperation on Climate Change: Numbers, Interests, and Institutions' (2006) 6(3) *Global Environmental Politics* 90–105.

Indeed, it is useful to consider the reasons that the Montreal Protocol is so unusual in its relative success. Analysts usually point to three fundamental explanations. First, the Protocol dealt with a narrowly defined class of chemicals produced in only a handful of countries, which meant that the number of key stakeholders whose interests had to be addressed was small and negotiations were manageable. Secondly, moving away from production of the chemicals did not require substantial disruption of a significant number of vested interests or significant lifestyles changes on the part of the public – indeed, major producers quickly discovered that they could quite profitably move to substitutes, and 'side payments' could be relatively small. Thirdly, once the 'hole' in the ozone layer over Antarctica was discovered, the issue could be readily framed in publicly appealing terms – everyone could understand the danger of a hole in the sky. Few of the challenges facing global energy governance are so relatively simple to address, given the enormous vested interests in and complexity of the existing systems.[38]

A third misconception is that regional energy governance is urgently needed rather than global energy governance. Patt makes this argument most compellingly.[39] He states that since global energy may happen but only eventually (owing to barriers to negotiation, the lack of trust among different countries, and the perceived importance of national sovereignty), we need regional energy governance to avoid dangerous climate change. Patt also believes that to catalyse investments in cleaner forms of energy such as wind turbines, concentrated solar power (CSP) and batteries, regional integration will be instrumental. Finally, Patt suggests that, drawing on the strength of the institutions of the EU and similar bodies, it might be easier to get regional energy governance than global energy governance. This type of regional energy governance may then be a good prerequisite for meaningful global energy governance. In sum, Patt is suggesting that the difficulties of meaningful global energy governance are so great that it might be good to start down that path at a regional scale with the EU, since it already has a track record of states benefiting from relinquishing some national sovereignty on important issues.

But Patt also admits, correctly, that even the EU, by far the most advanced example of regional cooperation the world has ever known, has struggled to achieve meaningful cooperation on energy issues. And even if the EU itself had developed excellent systems of energy governance, it is highly unlikely that those systems would work in the very different contexts of other regions. Within Asia in particular, applying regional models of energy governance simply will not work. Asia has only rudimentary institutions for cooperation,

38 Florini, note 3 above.

39 Patt, note 10 above.

making it unlikely that cooperation will occur on important issues, especially energy. China, India, Japan and Korea have a troubled history resulting in a dearth of trust among them. Nor is it clear whether they have fundamentally similar interests on energy and climate questions. Cooperation on large-scale, transnational energy infrastructure in South-East Asia remains scant owing to lack of technical expertise, inconsistent regulatory frameworks, weak political leadership, tensions over the pricing of energy resources and exports and pervasive mistrust and internal suspicion between members of the Association of Southeast Asian Nations and external suspicion of China, Japan and the United States.[40] Table 3 portrays how these barriers crisscross technical, economic, legal, political and environmental dimensions.

Table 3: Barriers to regional energy governance in South-East Asia

Technical	Economic	Legal	Political	Social	Environmental
Infrastructure construction and operation	Uncertainty surrounding energy reserves	Inconsistent regulatory frameworks	Contests over sovereignty	Poor participatory mechanisms	Land degradation
	Unknown future energy demand	Unclear protection of property rights	Diplomatic tensions	Lack of transparency	Accidents and spills
	Capital intensity	State control of markets	Protectionism	Relocation, resettlement and human rights concerns	Greenhouse gas emissions and climate change
	Financing	Weak mechanisms for dispute settlement	Lack of sustained leadership		
	Returns on investment	Disagreements over prices and tariffs			

Also, from a technological standpoint, large-scale and regional energy systems present enormous, possibly insuperable challenges to effective governance. To an extent regional scales of investment will be needed, substituting oil-, coal- and natural gas-fired power plants with renewable ones will require thousands of gigawatts of installed capacity. But we do not want to replicate all renewable energy systems in the image of fossil fuels. Large-scale energy systems, renewable or not, are much more difficult to govern. They tend to be more prone to cost over-runs. They present grave security risks because taking down one facility can cause cascading power outages. They rely on inefficient and brittle transmission networks prone to attack and accident. And they are amenable only

40 Benjamin K Sovacool, 'Energy Policy and Cooperation in Southeast Asia: The History, Challenges, and Implications of the Trans-ASEAN Gas Pipeline Network (TAGP)' (2009) 37(6) *Energy Policy* 2356–2367.

to rich countries or large corporate conglomerates with the necessary capital to finance construction, and have slower learning curves due to their capital intensity.[41] Consider the example of building concentrating solar power stations in Northern Africa that would export electricity to European markets: a single terrorist attack, accident, or severe weather event could effortlessly disrupt the high-voltage transmission lines carrying electricity between the continents, and distance of the transmission network would entail considerable efficiency losses.

Far more nimble and effective are small-scale, decentralised, modular renewable energy systems such as solar panels, run-of-the-river hydroelectric dams and residential wind turbines. These can be installed practically anywhere, in practically any configuration, and owned and operated by anyone, especially homeowners, cooperatives, hotels, hospitals and small enterprises. These 'bottom-up' systems improve energy security through diversification, provide ancillary services to the electricity grid rather than eroding its efficiency, and produce energy close to its point of consumption, improving reliability.

Many of the most successful examples of rapid diffusion, moreover, involve not grand, expensive, hundred megawatt power stations but small-scale systems with quick learning curves, such as cookstoves in China,[42] solar panels in Kenya[43] and biogas digesters in Bangladesh.[44] To be sure, both forms of technology – the big, centralised renewable power stations and the small, independent systems – will be needed in the electricity system of the future, but the latter cannot be done at a regional scale. They can and should only be done at the scale of individuals, neighbourhoods and cities.

Conclusion

To be sure, global energy governance is a complex topic, weaving together energy technologies, rules and actors engaged in a variety of different aspects of energy production and use. A robust dialogue on the

41 Amory Lovins, E Kyle Datta, Thomas Feiler, Andre Lehmann et al, *Small is Profitable: The Hidden Benefits of Making Electrical Resources the Right Size* (Snowmass: Rocky Mountain Institute, 2002); Jane Summerton and Ted K Bradshaw, 'Towards a Dispersed Electrical System: Challenges to the Grid' (January/February 1991), *Energy Policy* .

42 KR Smith, Gu Shuhua, Huang Kun and Qiu Daxiong, 'One Hundred Million Improved Cookstoves in China: How Was It Done?' (1993) 21(6) *World Development* 941–961.

43 R Acker and D Kammen, 'The Quiet (Energy) Revolution: The Diffusion of Photovoltaic Power Systems in Kenya' (1996) 24 *Energy Policy* 81–111.

44 MMG Hossain, 'Improved Cookstove and Biogas Programs in Bangladesh' (2003) 7(2) *Energy for Sustainable Development* 97–100.

nature, scope and challenges of energy and climate governance needs to occur. But more nuanced and careful assessment will be needed, and misconceptions abandoned, if we are truly to respond to the governance issues induced by deteriorating energy security and growing emissions of greenhouse gases.

One promising area of inquiry, an example of thinking creatively about global energy governance, comes from the work of the Nobel Laureate Elinor Ostrom. Ostrom suggests that no single scale but a blending of scales, something she calls polycentrism, creates optimal forms of governance.[45] Polycentric approaches imply that the sharing of power between numerous scales of governance must be seamlessly interwoven, resulting in a 'polycentricity' or 'nestedness' that involves multiple authorities and overlapping jurisdictions. The justification behind polycentric approaches is that conventional forms of governance such as top-down centralised control, bottom-up decentralised control and even free market privatisation have inescapable flaws in isolation.[46] Evidence has begun to emerge that polycentric and 'networked' approaches, not purely regional or local ones, can encourage plurality, promote dialogue, ensure redundancy and enhance accountability needed to respond to energy and climate dilemmas.[47] Here, then, relying on regional scales of energy governance alone would ignore the benefits of having them interact with other scales and actors.

Another promising area of inquiry concerns hybrid and partnership forms of energy governance. The prevalence of PPPs on the global energy scene – by far the fastest growing form of governance, and the most frequent type catalogued by our cursory assessment of global governors in Table 2 – suggests that they may be succeeded where other governance structures fail. Partnerships seem well suited to address various energy challenges and insecurities given their ability to attract private capital investment, increase efficient use of resources and maximise budgetary assets. They can, when properly structured, mobilise private capital and create synergies to accomplish public goals and needs; facilitate

45 Elinor Ostrom, 'The Governance Challenge: Matching Institutions to the Structure of Socio-Ecological Systems' in Simon Levin (ed), *The Princeton Guide to Ecology* (Trenton, NJ: Princeton University Press, 2009).

46 BK Sovacool, 'An International Comparison of Four Polycentric Approaches to Climate and Energy Governance' (2011) 39(6) *Energy Policy* 3832–3844.

47 See Ostrom, note 45 above; Adrian Smith, 'Emerging In Between: The Multi-Level Governance of Renewable Energy in the English Regions' (2007) 35 *Energy Policy* 6266–6280; Krister P Andersson and Elinor Ostrom, 'Analyzing Decentralized Resource Regimes from a Polycentric Perspective' (2008) 41 *Policy Sciences* 71–93; and Ora-Om Poocharoen and BK Sovacool, 'Exploring the Challenges of Energy and Resources Network Governance' (2012) 42 *Energy Policy* 409–418.

more efficient use of resources and improved service delivery; reduce corruption; and improve stakeholder engagement.[48]

A third promising area encompasses regulatory harmonisation and institutional coordination. United Nations Secretary-General Ban Ki-moon created the umbrella group 'United Nations-Energy' in 2010 to better synchronise efforts previously spread across more than 20 separate internal programmes, departments and divisions. UN-Energy has been especially involved in managing activities related to its declaration of 2012 as the 'International Year for Sustainable Energy for All'. This initiative seeks to engage governments, companies and other civil society actors to achieve three goals by 2030: universal access to modern energy services, reducing global energy intensity by 40 per cent and increasing renewable energy use globally to 30 per cent of total primary energy supply.[49] The Global Alliance for Cookstoves was created with support by the United Nations and US Secretary of State Hillary Clinton in order to harmonise attempts to distribute fuel-efficient stoves across hundreds of private, public and non-profit actors.[50] The Green Climate Fund created at the Copenhagen climate change discussions in 2010 endeavours to consolidate six separate large-scale sources of financing for climate change mitigation and adaptation. These are all relatively successful attempts to address the fragmentation and incoherence often plaguing the global energy governance environment.

A final promising approach may be to improve transparency and disclosure substantially in the energy sector. Efforts at global energy governance must contend with an extraordinary degree of opacity. In the oil sector, for example, where state-owned firms control 80 per cent of reserves, publicly available data on the actual extent of those reserves are known to be highly questionable. Numerous experiments using disclosure mechanisms to improve various aspects of global energy governance are under way, such as

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48 See Klaus Felsinger, *The Public-Private Partnership Handbook* (Manila: Asian Development Bank, 2010); Marian Moszoro and Paweł Gąsiorowski, 'Optimal Capital Structure of Public-Private Partnerships', *International Monetary Fund Working Paper WP/08/1* (New York: IMF, January 2008); J Broadbent and R Laughlin, 'Public-Private Partnerships: An Introduction' (2003) 16(3) *Journal of Accounting, Auditing & Accountability* 332–341; M Gerrard, 'Public-Private Partnerships' (2001) 38(3) *Finance and Development* ; P Grout, 'The Economics of Private Finance Initiatives' (1997) 13(4) *Oxford Review of Economic Policy* 53–66; P Grout, 'Public and Private Sector Discount Rates in Public-Private Partnerships' (2003) 113 *The Economic Journal* 62–68; P Vaillancourt-Rosenau, *Public-Private Policy Partnerships* (The MIT Press, Cambridge, 2000).

49 United Nations Foundation, '2012 International Year of Sustainable Energy for All' (2011), available at www.sustainableenergyforall.org/about.

50 Matthew Lee, 'Clean Cookstoves: Hillary Clinton Fights Cooking Deaths In Developing World' (20 July 2011), available at www.huffingtonpost.com/2011/07/20/clean-cook-stoves-hillary-clinton-cooking-deaths_n_904499.html.

the Joint Oil Data Initiative of the International Energy Forum, the Extractive Industries Transparency Initiative and the Carbon Disclosure Project run by a consortium of large institutional investors.[51] Such experiments all suffer from significant flaws in their current youthful incarnations, but they also hold promise for bringing about significant improvements in the management of global energy problems.

In short, we need concepts and analysis such as these – polycentrism, partnerships, coordination and disclosure, as well as others – that recognise the dilemmas of collective action and account for non-technical barriers, as well as models that do not presume that European experience will apply homogenously to communities around the world. We need assessments that confront the reality behind the failure of international environmental treaties, and an appreciation for small, decentralised, residential energy systems alongside dedication to large, centralised, commercial ones; and a willingness to promote approaches to energy and climate issues that blend local, regional and global scales of governance. Only when these conditions start to occur can the badly needed benefits of global energy governance begin to be realised.

51 Ann Florini and Saleena Saleem, 'Information Disclosure in Global Energy Governance', *Global Policy*: Special Issue on Global Energy Governance, September 2011, 144–154.